

EU CORSIA Africa and Caribbean

REGIONAL WORKSHOP

CORSIA IMPLEMENTATION AFTER ICAO 41st GENERAL ASSEMBLY

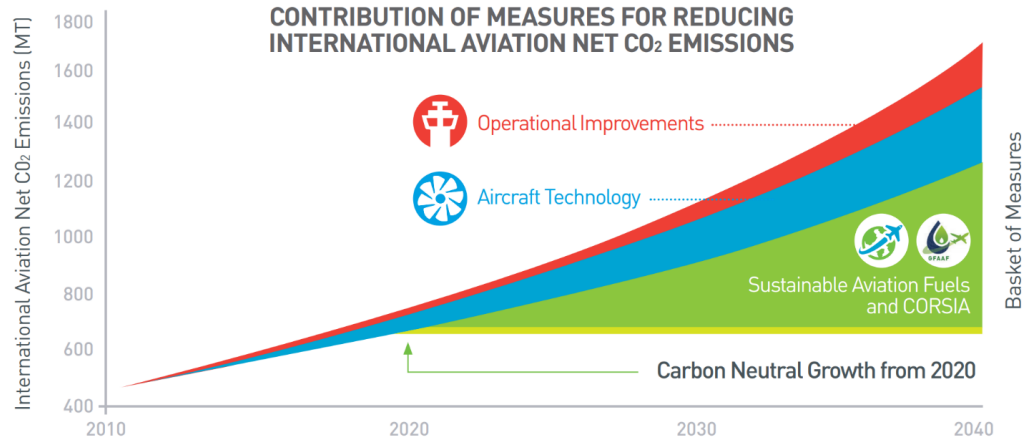
CORSIA Eligible Fuel and Supplementary Information to be Provided by the AO

Working for quieter and cleaner aviation.

Your safety is our mission.

Johannesburg, 10-13 May 2023

Why SAF in the ICAO Context?



Source: Introduction to the ICAO Basket of Measures to Mitigate Climate Change

- Technology-Design, Operations, **Sustainable Aviation Fuels (SAF)** and Market Based Measures.
- Expectation that drop-in SAF will play a significant role in the mitigation of aviation CO₂ emissions in the short term using existing global fleet.

SAF in Resolution A39-2

- ICAO Assembly recognized the “technological feasibility of drop-in sustainable alternative fuels for aviation” and acknowledged “the need for such fuels to be developed and deployed in an economically feasible, socially and environmentally acceptable manner”
- Resolution A39-2 also requested States to recognize that sustainable aviation fuels “should achieve net GHG emissions reduction on a life cycle basis, contribute to local social and economic development; competition with food and water should be avoided”.

SAF and CEF

- Due to CORSIA, ICAO created the following terms
 - *CORSIA eligible fuel (CEF)*. A CORSIA sustainable aviation fuel or a CORSIA lower carbon aviation fuel, which an operator may use to reduce their offsetting requirements.
 - *CORSIA lower carbon aviation fuel*. A fossil-based aviation fuel that meets the CORSIA Sustainability Criteria under this Volume (Annex 16, Volume IV)
 - *CORSIA sustainable aviation fuel*. A renewable or waste-derived aviation fuel that meets the CORSIA Sustainability Criteria under this Volume.

Therefore

CEF is a specific word for CORSIA context that includes CLCAF and CSAF and refers to fuels that can reduce offsetting obligations

SAF is a generic word for non-conventional aviation fuel

What is a Sustainable Aviation Fuel?

- There are three key elements to Sustainable Aviation Fuel or 'SAF'
 - **S**ustainability
 - **A**lternative
 - **F**uel

Sustainability

→ What does this mean?

- Sustainability means that it can be resourced again and again and doesn't deplete natural resources.
- Sustainability means that social and economic as well as environmental considerations are important.

Alternative

→ What does this mean?

- Normal or conventional aviation fuel is made from petroleum (oil) – like coal and natural gas this is a fossil-source.
- SAFs are ‘alternative’ as they are made from substances that can be made into fuel, but aren’t from these fossil sources.
- These alternatives can be biological or non-biological e.g., cooking oils and fats, plant oils, agricultural residues, municipal wastes and waste gases.

→ What does this mean?

- SAF must meet the required technical and certification requirements for use in commercial aircraft.
- Fuel isn't just used for combustion with an aircraft – it's also used inside the aircraft and engine as a lubricant, cooling fluid and hydraulic fluid.
- As such it's important that manufacturers don't have to redesign engines or aircraft and that fuel suppliers and airports don't have to build new infrastructure/fuel delivery systems to cater for SAF, and that it is a '**drop-in**' fuel.

Fuel Specifications

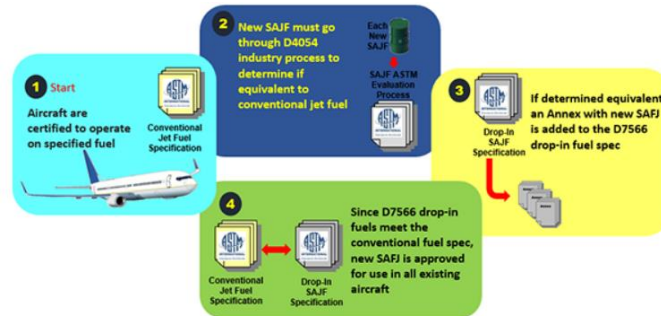
- Safety is the aviation industry's top priority and aviation is a highly regulated industry.
- To ensure technical and safety compliance, aviation fuel must be fit for purpose and meet internationally recognised standards.
- There are a number of standards globally, but the ASTM International standards which define the technical specifications of a fuel are most widely recognised.
- To meet these requirements a SAF must undergo strict laboratory, ground, and flight tests.

SAF Technical Certification

→ Drop-in fuels need to comply with international jet fuel specifications

These contain requirements for composition, volatility, fluidity, combustion, corrosion, thermal stability, contaminants, additives, etc.

I.e.: ASTM 1655 certification



Source: https://www.caafi.org/focus_areas/fuel_qualification.html#process

SAF Pathways

- ASTM D7566 identifies a number of pathways to produce neat SAF.
- Each pathway represents a different processes using specific feedstocks.
- Each of the pathways has its benefits, such as the availability of feedstock, cost of the feedstock, carbon reduction or cost of processing. Some may be more suitable than others in certain areas of the world.
- These pathways are the first part of the SAF Value Chain

ASTM SAF Pathways (Feedstock and Production)

Abbreviation	Production Pathway	Possible Feedstocks	Blending ratio by volume	Date of Approval	ASTM Reference
FT-SPK	Biomass Gasification and Fischer-Tropsch (Gas+FT)	Energy crops, lignocellulosic biomass, solid waste	50%	2009	ASTM D7566 Annex 1
HEFA-SPK	Hydroprocessed esters and Fatty Acids (HEFA)	Vegetable and animal fats	50%	2011	ASTM D7566 Annex 2
HFS-SIP	Direct Sugars to Hydrocarbons (DSHC)	Conventional sugars, lignocellulosic sugars	10%	2014	ASTM D7566 Annex 3
FT-SPK/A	Biomass Gasification and Fischer-Tropsch (Gas+FT) with Aromatics	Energy crops, lignocellulosic biomass, solid waste	50%	2015	ASTM D7566 Annex 4
ATJ-SPK	Alcohol to Jet (AtJ)	Sugar, starch crops, lignocellulosic biomass	50%	2016	ASTM D7566 Annex 5
CHJ or CH-SK	Catalytic Hydrothermolysis Jet	Vegetable and animal fat	50%	2020	ASTM D7566 Annex 6
HC-HEFA-SPK	HEFA from Algae	Microalgae oils	10%	2020	ASTM D7566 Annex 7
FOG Co-processing	Fats, Oils and Greases Co-processing	Fats, oils and greases	5%		ASTM D1655 Annex A1
FT Co-processing	Fischer-Tropsch Co-processing	Fischer-Tropsch (FT) biocrude	5%		ASTM D1655 Annex A1

Source: Adapted from the European Aviation Environmental Report 2022 (EASA).

Commercial Use of SAF

- The fact that a technology is certified does not mean that the fuel is also produced on a commercial scale.
- The technological maturity of each production pathway can be defined through a Fuel/Technology Readiness Level, which ranges from 1 for basic ideas, to 9 for an actual system proven in an operational environment.
- HEFA is currently the main pathway to SAF production.
- In addition to the current SAF pathways, there are other feedstock/technology combinations for SAF production are currently under development and in the process of getting ASTM qualification.

How does SAF fit in the context of CORSIA?

CORSIA Implementation for CEF

→ Requirements for CEF:



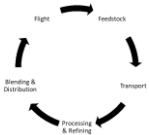
- That the fuel meets the CORSIA Sustainability Criteria as defined within the ICAO document entitled “Sustainability Criteria for CORSIA Eligible Fuels”



- That the fuel comes from fuel producers that are certified by an approved Sustainability Certification Scheme included in the ICAO document entitled “CORSIA Approved Sustainability Certification Schemes”



- That such certification scheme meets the requirements included in the ICAO document entitled “CORSIA Eligibility Framework and Requirements for Sustainability Certification Schemes”



- That the Life Cycle Emissions of the Fuel is defined either by using the default values established in the ICAO document “Default Life Cycle Emissions Values for CORSIA Eligible Fuels” or making an actual calculation using the doc. “CORSIA Methodology for Calculating Actual Life Cycle Emissions Values”

CORSIA Implementation for CEF

→ Five ICAO documents relative to the CORSIA CEF:

CORSIA Eligibility
Framework and
Requirements for
Sustainability
Certification Scheme

CORSIA Approved
Sustainability
Certification Schemes

Sustainability Criteria
for CORSIA Eligible Fuels

Default Life Cycle
Emissions Values for
CORSIA Eligible Fuels

CORSIA Methodology
for Calculating Actual
Life Cycle Emissions
Values

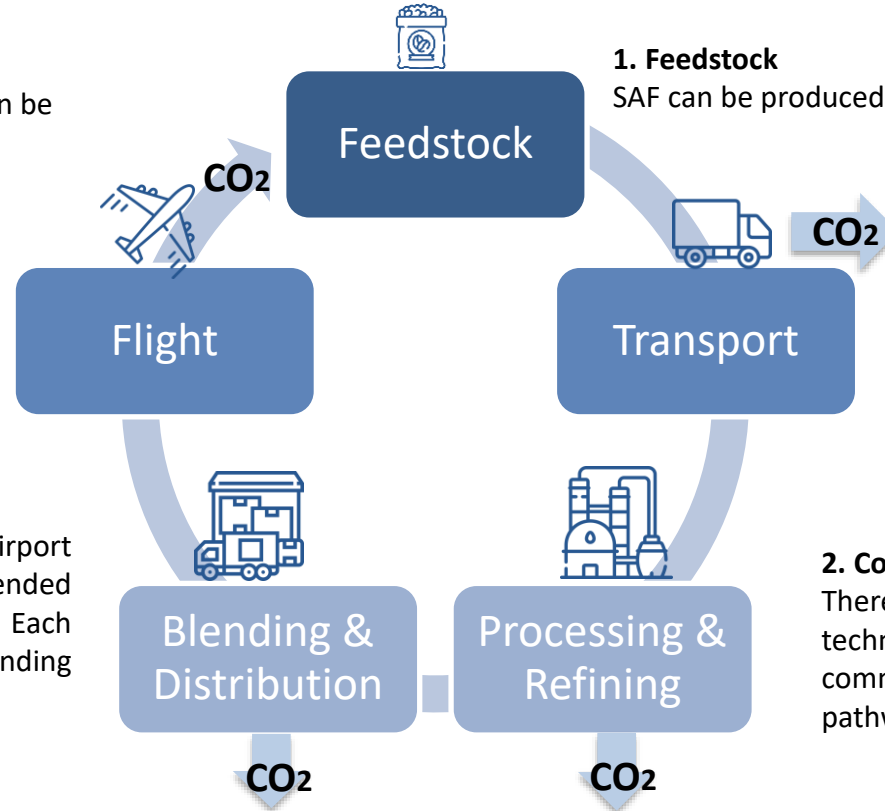
What do we mean when we say emissions are reduced “on a lifecycle basis” ?

4. End use

Certified SAF is a drop-in fuel and can be safely used in existing engines.

3. Downstream logistics

Before SAF can be delivered into airport storage tanks, it needs to be blended with conventional jet fuel. Each conversion pathway has its own blending limit.



1. Feedstock

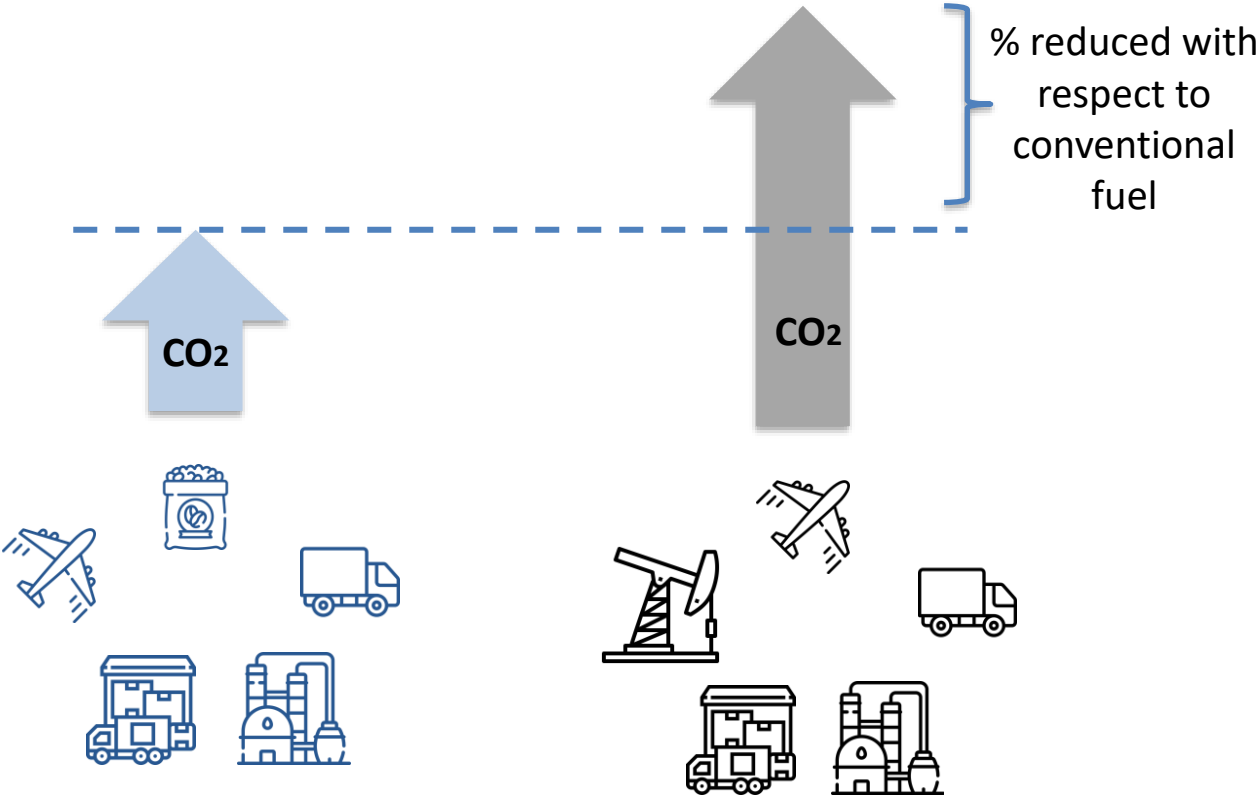
SAF can be produced from a variety of feedstock

2. Conversion

There are currently 7 feedstock-technology pathways certified for use in commercial aviation plus 2 co-processing pathways.

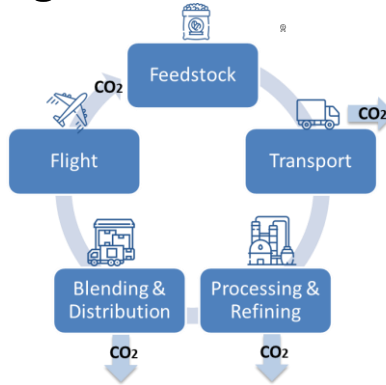
What does “on a lifecycle basis” mean?

Emissions need to be compared with conventional fuel through Life Cycle Analysis (LCA) to quantify the emissions reduction achieved through SAF



Sustainability of the Value Chain

→ Sustainability Certification covers the complete supply chain, from production and processing to trade

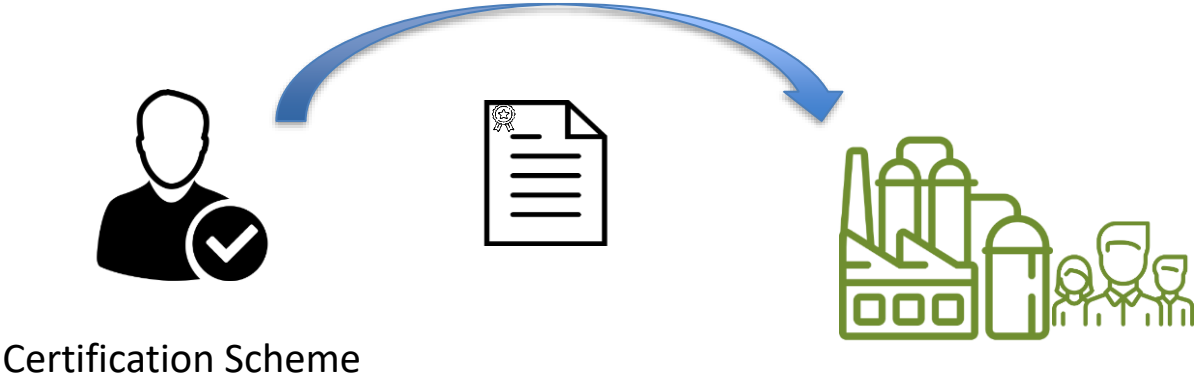


→ What criteria do they consider?

- GHG emissions reductions in comparison to their petroleum counterparts
- Sustainable production, other environmental impacts, efficient energy conversion, protection of biodiversity, contribution to local prosperity and welfare...

Sustainability Schemes Under CORSIA

Performance-based schemes aiming to achieve a certain standard and include a number of principles, criteria and indicators to verify compliance.



Sustainability Schemes Under CORSIA



ICAO

INTERNATIONAL CIVIL AVIATION ORGANIZATION

ICAO document

CORSIA Approved Sustainability Certification Schemes



November 2020

CORSIA


Carbon Offsetting and Reduction Scheme for International Aviation

→ Currently there are two approved Sustainability Certification Schemes by ICAO:



How Does the AO Inform of Compliance with CORSIA Sustainability Requirements?

1. Emissions Report
2. Supplementary CORSIA Eligible Fuels Template

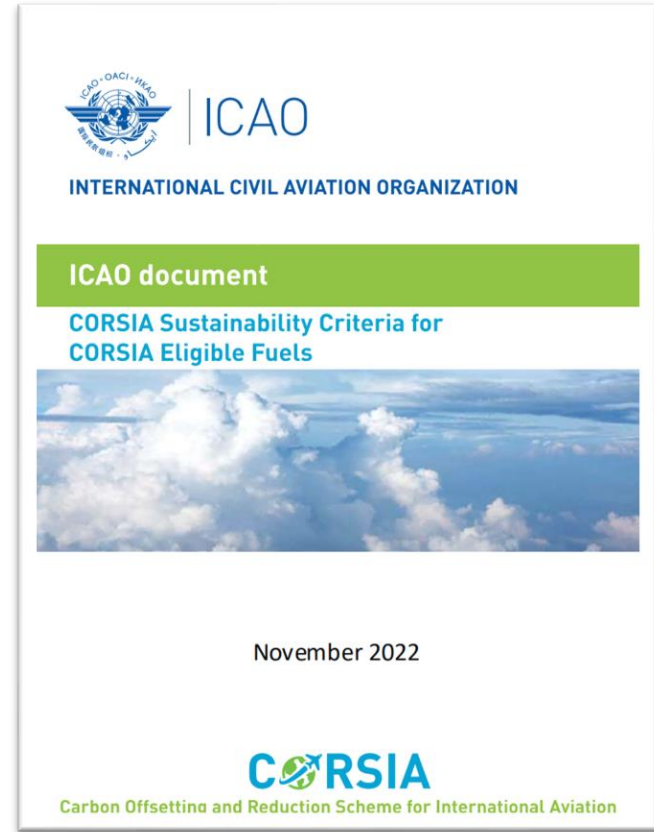


Both to be Verified by
VB

Sustainability Criteria

→ Current doc. “Sustainability Criteria for CORSIA Eligible Fuels” contains criteria for:

- CSAF Produced before 1 Jan 2024
- CSAF Produced after 1 Jan 2024
- LCAF Produced after 1 Jan 2024



Why is it Important to Provide Sustainability Information in the Context of CORSIA?

CORSIA credits the use of alternative fuels

- AOs can reduce their offsetting requirements in a given year by claiming emissions reductions from the use of eligible fuels
- When the State communicates the final CO₂ offsetting requirements, it will account for the benefits from the use of eligible fuels

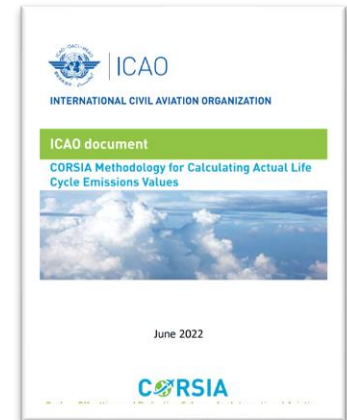
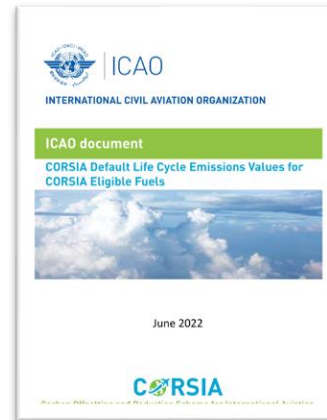


How Does the AO Reduce its Offsetting Requirements from the use of CEF?

1. AO obtains the life cycle emissions value (LS_f) of the CEF considering all the Steps of the production process

LS_f Value will come in the Sust. Documentation and is calculated summing up:

- Core LCA Value (Default or Actual)
- ILUC LCA Value (Default)



Example of LS_f from ICAO Default Values Doc.

ICAO document - CORSIA Default Life Cycle Emissions Values For CORSIA Eligible Fuels

Table 2. CORSIA Default Life Cycle Emissions Values for CORSIA Eligible Fuels produced with the Hydroprocessed Esters and Fatty Acids (HEFA) Fuel Conversion Process

Region	Fuel Feedstock	Pathway Specifications	Core LCA Value	ILUC LCA Value	LS_f (gCO _{2e} /MJ)
Global	Tallow		22.5	0.0	22.5
Global	Used cooking oil		13.9		13.9
Global	Palm fatty acid distillate		20.7		20.7
Global	Corn oil	Oil from dry mill ethanol plant	17.2		17.2
USA	Soybean oil		40.4	24.5	64.9
Brazil	Soybean oil		40.4	27.0	67.4
EU	Rapeseed oil		47.4	24.1	71.5
Malaysia & Indonesia	Palm oil	At the oil extraction step, at least 85% of the biogas released from the POME treated in anaerobic ponds is captured and oxidized.	37.4	39.1	76.5
Malaysia & Indonesia	Palm oil	At the oil extraction step, less than 85% of the biogas released from the POME treated in anaerobic ponds is captured and oxidized.	60.0	39.1	99.1
Brazil	Brassica carinata	Feedstock is grown as a secondary crop that avoids other crops displacement	34.4	-20.4	14.0
USA	Brassica carinata	Feedstock is grown as a secondary crop that avoids other crops displacement	34.4	-21.4	13.0

Core LCA: refers to the value of emissions produced per unit of energy during the production process of that fuel

ILUC LCA: refers to the GHG emissions that it is assumed takes place due to the ILUC generated because of the production of that fuel.

How Does the AO Reduce its Offsetting Requirements from the use of CEF?

2. AO Calculates the CEF emissions reductions (ER_y) as follows:

$$ER_y = FCF \times \left[\sum_f MS_{f,y} \times \left(1 - \frac{LS_f}{LC} \right) \right]$$

*Fuel Conversion Factor, fixed value,
3.16 for Jet-A/ Jet-A1 or 3.10 for AvGas/ Jet B
[kg CO₂/kg fuel]*

*Total mass of CEF claimed
in the year y, by fuel type f [tonnes]*

*Baseline life cycle emissions,
fixed value, 89 for jet fuel or
95 for AvGas [gCO_{2e}/MJ]*

i.e.: If in 2023 an AO uses 10 000 tonnes of Jet-A fuel produced from UCO, and the default $LS_f = 13.9 \text{ gCO}_2\text{e/MJ}$

$$ER_y = 3.16 \times (10\,000 \times (1 - \frac{13.9}{89})) = 26\,665 \text{ tonnes of CO}_2$$

How Does the AO Reduce its Offsetting Requirements from the use of CEF?

3. AO includes the information on CEF in its Emissions Report:

- CEF Emissions reductions (ER_y) claimed
- Fuel type, mass, and life cycle emissions value (LS_f)
- Evidence of Compliance with CORSIA sustainability criteria

How Does the AO Reduce its Offsetting Requirements from the use of CEF?

4. VB verifies the information on CEF provided in ER and Supplementary Info. Note that VBs are not expected to audit the CORSIA eligible fuel producers directly, but rather:

- Check that sustainability documentation is reliable and comes from CORSIA approved Sust. Certification Schemes
- CEF meets CORSIA sustainability criteria
- Reported batch volumes/mass are reasonable and reliable
- Confirm fuel types are eligible under CORSIA
- Confirm that emissions reduction calculation is correct

Total Offsetting Requirements with CEF

→ This is calculated by State as follows:

$$\text{FOR} = (\text{OR}_1 + \text{OR}_2 + \text{OR}_3) - (\text{ER}_1 + \text{ER}_2 + \text{ER}_3)$$

FOR : AO's total final offsetting requirements

OR: AO's offsetting requirements

ER: Emission reductions from the use of CEF

Information Provided in ER

a) Summary of reported international flights and emissions

Total CO ₂ emissions from international flights (in tonnes):	762953.88
Total CO ₂ emissions from flights subject to offsetting requirements (in tonnes):	219380.24
Total number of international flights during reporting period:	8459
Total number of international flights subject to offsetting requirements:	3420
Total emissions reductions claimed from the use of CORSIA eligible fuels (in tonnes):	

→ Total flights and emissions from International flights

→ Total flights and emissions from International flights with offsetting requirements

→ Total emissions reductions claimed from use of CORSIA eligible fuels

→ Summary of total fuel quantity per fuel type

→ Summary of CORSIA eligible fuels claimed

b) Summary of fuel quantities⁽¹⁾ (in tonnes):

⁽¹⁾ For the purposes of this template, the fuel total could include the sum of equivalent fuels.

Jet-A	
Jet-A1	
Jet-B	
AvGas	

b1) CORSIA eligible fuels claimed

If claiming emission reductions from the use of CORSIA eligible fuels, please complete the table below. Supplementary information about the claim is also required, and can be reported using the CORSIA eligible fuels supplementary information template.

⁽¹⁾ For the purposes of this template, the fuel total could include the sum of equivalent fuels.

Fuel type (e.g. Jet-A1)	Fuel type		Total mass of the neat CORSIA eligible fuel (in tonnes)	Approved Life Cycle Emissions values	Emission reductions claimed
	Feedstock	Conversion process			
Total emission reductions from the use of CORSIA eligible fuel(s) claimed					

Monitoring & Reporting of CEF

- As these fuels might not be physically used in the aeroplane of the AO, the claims and **monitoring** will be **based on purchasing and blending** records.
- However, if AO cannot demonstrate the compliance of the CORSIA eligible fuel with the CORSIA Sustainability Criteria, then it shall not be accounted for as CORSIA eligible fuel

CORSIA Eligible Fuels Supplementary Info.

- The AO to indicate in the ER if it uses CORSIA Eligible fuels to attach an additional CORSIA Eligible Fuels Supplementary Information
- In this template the AO should include
 - AO information
 - Amount of Fuel Claimed
 - Information regarding that fuel

CORSIA

**CORSIA ELIGIBLE FUELS
SUPPLEMENTARY INFORMATION***

*supplementary information to the Emissions Report from aeroplane operator to State

CONTENTS

- [Template information](#)
- [Aeroplane operator identification and reporting information](#)
- [CORSIA eligible fuel claim form](#)
- [Summary of CORSIA eligible fuels information](#)

Template Information

Template provided by:	
Version (publication date):	

AO Identification

AEROPLANE OPERATOR IDENTIFICATION AND REPORTING INFORMATION

a) Name of aeroplane operator

Please enter the name of the aeroplane operator. This name should be the legal entity carrying out the aviation activities.

a1) Address of the aeroplane operator

Please enter the address of the aeroplane operator.

Address:	<input type="text"/>
City:	<input type="text"/>
State/Province/Region:	<input type="text"/>
Postcode/ZIP:	<input type="text"/>
Country:	<input type="text"/>

b) Reporting year

AO to provide its identification and reporting year

Fuel Claim

For each claim of emission reductions from the use of CEF a CEF Claim Form is required

CORSIA ELIGIBLE FUEL CLAIM FORM

Note: for each claim of emissions reductions from the use of CORSIA eligible fuels, please replicate this form and fill separately.

Fuel Claim #:

a) Purchase date

Please enter the date when the neat CORSIA eligible fuel was purchased. Use the format yyyy-mm-dd.

Data on the Producer

→ The producer of the batch needs to be identified and contact details need to be provided:

b) Identification of the producer of the CORSIA eligible fuel

b1) Name of producer of the neat CORSIA eligible fuel

Please enter the name of the fuel producer.

b2) Address of the producer of the neat CORSIA eligible fuel

Please enter the address of the producer of the neat CORSIA eligible fuel.

Address:	<input type="text"/>
City:	<input type="text"/>
State/Province/Region:	<input type="text"/>
Postcode/ZIP:	<input type="text"/>
Country:	<input type="text"/>

Data on Fuel Production

c) Fuel production

c1) Date of production of the neat CORSIA eligible fuel

Please enter the date of production of the neat CORSIA eligible fuel. Use the format yyyy-mm-dd.

c2) Location of the production of the neat CORSIA eligible fuel

Please enter the address of the production of the neat CORSIA eligible fuel.

Address:	<input type="text"/>
City:	<input type="text"/>
State/Province/Region:	<input type="text"/>
Postcode/ZIP:	<input type="text"/>
Country:	<input type="text"/>

c3) Batch identification number:

c4) Mass of each batch of neat CORSIA eligible fuel produced

Please enter the total mass of each batch of neat CORSIA eligible fuel produced (in tonnes).

Information regarding the date of production, location, batch ID and total mass is required

Information on Fuel Type

d) Fuel type

d1) Type of fuel

Please enter the type of fuel (i.e., Jet-A, Jet-A1, Jet-B, AvGas) for the purpose of computation of Life Cycle Emissions factors.

d2) Feedstock type

Please enter the information on the feedstock used to create the neat CORSIA eligible fuel.

d3) Conversion process

Please enter the conversion process (i.e., a type of technology used to convert a feedstock into neat CORSIA eligible fuel).

This includes the feedstock type and conversion process

Batch Portion

In case not the whole batch is bought by the operator.....

e) Portion of batch purchased (if needed)

a1) Percentage

If less than an entire batch of neat CORSIA eligible fuel is purchased, please enter the proportion of neat CORSIA eligible fuel batch purchased (in percentage terms).

a2) Mass of batch purchased

Please enter the mass of CORSIA eligible fuel batch purchased (in tonnes).

f) Mass of neat CORSIA eligible fuel

Please enter the total mass of all batches of neat CORSIA eligible fuel included in the claim (in tonnes).

This is important since up until today all certified SAF requires to be blended up to a certain percent with conventional fuel

Emissions & Sustainability Info.

g) Sustainability documentation

Please provide evidence that the fuel satisfies the CORSIA Sustainability Criteria i.e., reference of attached valid certification document.

h) Life Cycle Emissions Values of the CORSIA eligible fuel

h1) Default or Actual Life Cycle Emissions value (LS_f)

Please enter the Life Cycle Emissions value (in gCO_2e/MJ).

h2) Default or Actual Core Life Cycle Assessment (LCA) value

Please enter the Core Life Cycle Assessment (LCA) value (in gCO_2e/MJ).

h3) Default Induced Land Use Change (ILUC) value

Please enter the Induced Land Use Change (ILUC) value (in gCO_2e/MJ).

Traceability of the Chain of Custody

If AO is not the original purchaser, information of intermediate purchasers is required:

Also applicable for the shipper:

i) Intermediate purchaser 1 (if needed)

If the aeroplane operator claiming emissions reductions from the use of CORSIA eligible fuels is not the original purchaser of the fuel from the producer (e.g., the aeroplane operator purchased fuel from a broker or a distributor), include the identity and contact information of these purchaser(s).

i1) Name of the intermediate purchaser 1.

Please enter the name of the intermediate purchaser 1.

i2) Address of the intermediate purchaser 1.

Please enter the address of the intermediate purchaser 1.

Address:	<input type="text"/>
City:	<input type="text"/>
State/Province/Region:	<input type="text"/>
Postcode/ZIP:	<input type="text"/>
Country:	<input type="text"/>

k) CORSIA eligible fuel shipper

k1) Name of the CORSIA eligible fuel shipper.

Please enter the name of the party responsible for shipping of the neat CORSIA eligible fuel to the fuel blender.

k2) Address of the CORSIA eligible fuel shipper.

Please enter the address of the party responsible for shipping of the neat CORSIA eligible fuel to the fuel blender.

Address:	<input type="text"/>
City:	<input type="text"/>
State/Province/Region:	<input type="text"/>
Postcode/ZIP:	<input type="text"/>
Country:	<input type="text"/>

Traceability of the Chain of Custody

.... As well as for the blender

The objective is to make the chain of custody traceable

l) Fuel blender

l1) Name of the fuel blender

Please enter the name of the party responsible for blending neat CORSIA eligible fuel with aviation fuel.

l2) Address of the fuel blender

Please enter the address of the party responsible for blending neat CORSIA eligible fuel with aviation fuel.

Address:	
City:	
State/Province/Region:	
Postcode/ZIP:	
Country:	

m) Location of blending

Please enter the location where the neat CORSIA eligible fuel is blended with aviation fuel.

Address:	
City:	
State/Province/Region:	
Postcode/ZIP:	
Country:	

Information on Neat Fuel Claimed

n) Neat CORSIA eligible fuel received

n1) Date the neat CORSIA eligible fuel was received

Please enter the date the neat CORSIA eligible fuel was received by blender. Use the format yyyy-mm-dd.

n2) Mass of neat CORSIA eligible fuel received

Please enter the mass of neat CORSIA eligible fuel received (in tonnes).

o) Blend ratio of neat CORSIA eligible fuel and aviation fuel

Please enter the blend ratio of neat CORSIA eligible fuel and aviation fuel.

p) Documentation demonstrating blending

Please provide documentation demonstrating that the batch or batches of CORSIA eligible fuel were blended into aviation fuel (e.g., the subsequent Certificate of Analysis of the blended fuel).

q) Mass of neat CORSIA eligible fuel claimed

Please enter the mass of neat CORSIA eligible fuel claimed (in tonnes).

The total neat CEF information as well as the blend ratio is required

AO to provide documentation demonstrating that the batch was blended into aviation fuel

Summary of CEF Used by the AO

$$ER = 3.16 \times 3500 \times (1 - 13.9 / 89) = 9\,332 \text{ tonnes}$$

SUMMARY OF CORSIA ELIGIBLE FUELS INFORMATION

a) Summary of CORSIA eligible fuels (by fuel claim #)

Please provide a summary of the CORSIA eligible fuels claimed for the reporting year.

Fuel claim #	Fuel type			Total mass of neat CORSIA eligible fuel claimed (in tonnes)	Life cycle emissions values of the CORSIA eligible fuel	Emissions reduction from CORSIA eligible fuels claimed (in tonnes)
	Type of fuel	Feedstock type	Conversion process			
1	Jet-A1	UCO	HEFA	3,500	14	9,332
2						
3						
4						
5						
6						
7						
8						
9						
10						

b) Summary of information of CORSIA eligible fuels claimed

b1) Total of emissions reduction from CORSIA eligible fuels claimed (in tonnes)

Please enter the sum of the values included in column "Emissions reduction from CORSIA eligible fuels claimed (in tonnes)" of the table above.

9,332

Thank you for your attention!

easa.europa.eu/connect



Your safety is our mission.

An Agency of the European Union 